UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/713,493	11/14/2003	Gary Edward Trewiler	134314	9211

23465 7590 04/19/2005

JOHN S. BEULICK
C/O ARMSTRONG TEASDALE, LLP
ONE METROPOLITAN SQUARE
SUITE 2600
ST LOUIS, MO 63102-2740

EXAMINER	
LE, HUNG CHARLIE	
ART UNIT	**PAPER NUMBER**
3725	

DATE MAILED: 04/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/713,493	TREWILER ET AL.	
	Examiner	Art Unit	
	Hung C. Le	3726	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 November 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 - 20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 - 20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *14 November 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *11/14/2003*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

The disclosure is objected to because of the following informalities:

In "DETAIL DESCRIPTION OF THE INVENTION":

In Paragraph [0021] referred "... a replacement 120 is coupled..."

In paragraph [0022] referred "...replacement tip 120 and..."

Appropriate correction is required.

Claim Objections

Claim 12 objected to because of the following informalities:

A word "wherein" between "...Claim 8..." and " ...cutting through..." is missing.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraph of 35 U. S. C. 102 that form the basis for the rejections under this section made in this Office action::

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2, 5, 6, 8, 9, 11, 12, 14, 15, 17, 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Patsfall (4,883,216).

With regard to claims 1:

Patsfall discloses: According to the present invention, projection or airfoil (20) is severed along a cut line (24), shown as a broken line in FIG. 2, to remove a damaged portion of the airfoil and to provide a projection or airfoil stub (26) connected to and integral with hub (22), for example in the vicinity of airflow surface (28) (see Col. 3, Lines 11-16). Replacement member (62) (FIG. 7) includes a replacement airfoil (64) and a bonding portion (66) from which airfoil (64) extends (see Col 4, Lines 38 - 40). Then the replacement member and the stub-collar combination are bonded together at the first and second bonding interfaces (see Col. 4, Lines 43 – 46).

With regard to claim 2:

Patsfall discloses: it is convenient to bond metal members used in the practice of the present invention with metallurgical joining method such as pressure bonding, friction welding, diffusion bonding, etc. (see Col 4, Lines 50 – 54)

With regard to claim 5:

Patsfall discloses: Generally to enhance such bonding, the material of the bonding interfaces, and consequently generally the replacement member, is substantially the same as, or at least compatible with, the material of the stub-collar combination (see Col.4, Lines 46 – 50).

Furthermore "same material" is also mentioned in (Col. 7, Lines 51 – 53), in (Col. 8,

Lines 22 – 24), and in (Col. 8, Lines 61 – 62)

With regard to claim 6:

Patsfall discloses: The fragmentary perspective view of FIG. 1 and the sectional view of FIG. 2 present a bladed disk or "blisk" comprising a blading member or airfoil (20) as an integral projection from a support or hub (22). Damage can occur to the blading member, for example during its operation in power generating apparatus such as a turbine engine. In such event, the airfoil (20) must be repaired.

According to the present invention, projection or airfoil (20) is severed along a cut line (24), shown as a broken line in FIG. 2, ... (see Col. 3, Lines 4 – 13)

With regard to claim 8:

Patsfall discloses: With the use of distinct or separately manufactured and mechanically assembled blades and supporting structure, repair has included disassembly of the mechanically attached members, removal of the damaged blade and reassembly with a replacement blade (see Col. 1, Lines 29 – 34).

According to the present invention, projection or airfoil (20) is severed along a cut line (24), shown as a broken line in FIG. 2, to remove a damaged portion of the airfoil and to provide a projection or airfoil stub (26) connected to and integral with hub (22), for example in the vicinity of airflow surface (28) (see Col. 3, Lines 11-16). Replacement member (62) (FIG. 7) includes a replacement airfoil (64) and a bonding portion (66) from which airfoil (64) extends (see Col 4, Lines 38 - 40). Then the replacement

member and the stub-collar combination are bonded together at the first and second bonding interfaces (see Col. 4, Lines 43 – 46).

Contouring of the replacement blade to the remaining blade can be found in said disclosure as "general alignment with the stub top portion" (see Col 8, Line 9; Lines 52 – 53, and Col. 10, Lines 22 – 23)

With regard to claim 9:

Patsfall discloses: it is convenient to bond metal members used in the practice of the present invention with metallurgical joining method such as pressure bonding, friction welding, diffusion bonding, etc. (see Col 4, Lines 50 – 54)

With regard to claim 11:

Patsfall discloses: Generally to enhance such bonding, the material of the bonding interfaces, and consequently generally the replacement member, is substantially the same as, or at least compatible with, the material of the stub-collar combination (see Col.4, Lines 46 – 50).

Furthermore "same material" is also mentioned in (Col. 7, Lines 51 – 53), in (Col. 8, Lines 22 – 24), and in (Col. 8, Lines 61 – 62)

With regard to Claim 12:

Patsfall discloses: The fragmentary perspective view of FIG. 1 and the sectional view of FIG. 2 present a bladed disk or "blisk" comprising a blading member or airfoil (20) as an

integral projection from a support or hub (22). Damage can occur to the blading member, for example during its operation in power generating apparatus such as a turbine engine. In such event, the airfoil (20) must be repaired.

According to the present invention, projection or airfoil (20) is severed along a cut line (24), shown as a broken line in FIG. 2, ... (see Col. 3, Lines 4 – 13)

With regard to claim 14:

Patsfall discloses: In one specific example of the present invention, the airfoil of a titanium alloy blisk, made of a commercially available alloy comprising 6 Al, 4 V balance Ti was repaired by first removing the damage airfoil in its solid portion by machining (see Col 6, Lines 26 – 30)

After preparation of the stub-collar combination, a replacement member of that same titanium alloy was provided and positioned as shown in FIG. 10, ...(see Col 6, Lines 51 – 53).

In regard to claim 15:

Patsfall discloses: With the use of distinct or separately manufactured and mechanically assembled blades and supporting structure, repair has included disassembly of the mechanically attached members, removal of the damaged blade and reassembly with a replacement blade (see Col. 1, Lines 29 – 34).

According to the present invention, projection or airfoil (20) is severed along a cut line (24), shown as a broken line in FIG. 2, to remove a damaged portion of the airfoil and to

provide a projection or airfoil stub (26) connected to and integral with hub (22), for example in the vicinity of airflow surface (28) (see Col. 3, Lines 11-16). Replacement member (62) (FIG. 7) includes a replacement airfoil (64) and a bonding portion (66) from which airfoil (64) extends (see Col 4, Lines 38 - 40). Then the replacement member and the stub-collar combination are bonded together at the first and second bonding interfaces (see Col. 4, Lines 43 – 46).

Contouring of the replacement blade to the remaining blade can be found in said disclosure as "general alignment with the stub top portion" (see Col 8, Line 9; Lines 52 – 53, and Col. 10, Lines 22 – 23).

With regard to claim 17:

Patsfall discloses: Generally to enhance such bonding, the material of the bonding interfaces, and consequently generally the replacement member, is substantially the same as, or at least compatible with, the material of the stub-collar combination (see Col.4, Lines 46 – 50).

Furthermore "same material" is also mentioned in (Col. 7, Lines 51 – 53), in (Col. 8, Lines 22 – 24), and in (Col. 8, Lines 61 – 62).

With regard to claim 19:

Patsfall discloses: In one specific example of the present invention, the airfoil of a titanium alloy blisk, made of a commercially available alloy comprising 6 Al, 4 V balance

Ti was repaired by first removing the damage airfoil in its solid portion by machining (see Col 6, Lines 26 – 30)

After preparation of the stub-collar combination, a replacement member of that same titanium alloy was provided and positioned as shown in FIG. 10, ...(see Col 6, Lines 51 – 53).

Claims 1 – 3, 7, 8, 13, 15, 18, 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Dulaney et al. (US 6,238,187 B1).

With regard to claim 1:

Dulaney et al. discloses: A method for repairing a damage airfoil (10) in shown in FIG. 11, airfoil (10) has leading edge damage (12), surface damage (20) and tip damage (80). The weld repair procedure depicted in FIG. 11 is to replace substantially the entire portion of airfoil (10) from above the determined low stress location as indicated by dash line (82) is milled away or cut off leaving a void where the section of airfoil (10) was removed and a stub (84) having cut-away surface (86) for receiving a replacement piece, as depicted in FIG. 12. Replacement piece (88), in the preferred embodiment, is slightly larger in geometry (see Col. 14, Lines 57 – 67) whereby replacement piece (88) is slightly thicker, wider and taller than the removed section. Replacement piece (88) is welded to cut-away surface (84) using electron beam welding technique as depicted in FIG. 13a. A weld joint having seam (90) forms the joinder of replacement piece (88) to stub (84). The weld bead extends along the juncture of cut away surface (86), stub (84),

and replacement piece (88) past the intersection (92) of stub (84) with replacement piece (88). Airfoil (10) with joined replacement piece (88) forms a joined airfoil which is shaped to be within predetermined dimensional tolerances as previously described and depicted in FIG. 13b. Seam (90) is laser shock processed with at least a single track of overlapping laser processing spots spanning between leading edge (66) and trailing edge (67) (see Col. 15, Lines 1 – 14).

With regard to claim 2:

Dulaney et al. discloses: The joining step may further include the step of welding the replacement piece to the airfoil at the cut away surface (see Col. 4, Lines 9 – 10).

With regard to claim 3:

Dulaney et al. discloses: The joined airfoil is shaped to return the jointed airfoil to within predetermined dimensional tolerances (step 29) (FIG. 2). In one embodiment, the predetermined dimensional tolerance is substantially the same as a non-damaged airfoil. The process of shaping the joined airfoil comprises contour-milling the joined airfoil to a slightly oversized finished airfoil contour envelope. A subsequent hand-contouring grinding achieves a finished dimension of the joined airfoil (see Col. 12, Lines 29 – 36).

With regard to claim 7:

Dulaney et al. discloses: The joining step may further include the step of welding the replacement piece to the airfoil at the cut away surface (see Col 4, Lines 9 – 10). Furthermore Dulaney et al. disclose: Weldment run-out tabs are spot welded to the replacement piece, and the replacement piece is welded to the airfoil to maintain position prior to electron beam (EB) welding. A "line-of-sight" EB weld bead is deposited on one-side of the airfoil (either the pressure or suction side). A touch-up tig weld may be required on the opposite side of the weld to eliminate any EB weld beam blow-through and/or weldment underfill (see Col 8, Lines 29 - 37).

With regard to claim 8:

Dulaney et al. discloses:

Another advantage of the present invention is that the particular repair operation involving the removal of a component portion that encompasses the damage area...(see Col 4, Lines 41 – 43)

A method for repairing a damage airfoil (10) in shown in FIG. 11, airfoil (10) has leading edge damage (12), surface damage (20) and tip damage (80). The weld repair procedure depicted in FIG. 11 is to replace substantially the entire portion of airfoil (10) from above the determined low stress location as indicated by dash line (82) is milled away or cut off leaving a void where the section of airfoil (10) was removed and a stub (84) having cut-away surface (86) for receiving a replacement piece, as depicted in FIG. 12. Replacement piece (88), in the preferred embodiment, is slightly larger in geometry (see Col. 14, Lines 57 – 67) whereby replacement piece (88) is slightly thicker, wider

and taller than the removed section. Replacement piece (88) is welded to cut-away surface (84) using electron beam welding technique as depicted in FIG. 13a. A weld joint having seam (90) forms the joinder of replacement piece (88) to stub (84). The weld bead extends along the juncture of cut away surface (86), stub (84), and replacement piece (88) past the intersection (92) of stub (84) with replacement piece (88). Airfoil (10) with joined replacement piece (88) forms a joined airfoil which is shaped to be within predetermined dimensional tolerances as previously described and depicted in FIG. 13b. Seam (90) is laser shock processed with at least a single track of overlapping laser processing spots spanning between leading edge (66) and trailing edge (67) (see Col. 15, Lines 1 – 14). The joined airfoil is shaped to return the jointed airfoil to within predetermined dimensional tolerances (step 29) (FIG. 2). In one embodiment, the predetermined dimensional tolerance is substantially the same as a non-damaged airfoil. The process of shaping the joined airfoil comprises contour-milling the joined airfoil to a slightly oversized finished airfoil contour envelope. A subsequent hand-contouring grinding achieves a finished dimension of the joined airfoil (see Col. 12, Lines 29 – 36)

With regard to claim 13:

Dulaney et al. discloses: The joining step may further include the step of welding the replacement piece to the airfoil at the cut away surface (see Col 4, Lines 9 – 10). Furthermore Dulaney et al. disclose: Weldment run-out tabs are spot welded to the replacement piece, and the replacement piece is welded to the airfoil to maintain

position prior to electron beam (EB) welding. A "line-of-sight" EB weld bead is deposited on one-side of the airfoil (either the pressure or suction side). A touch-up tig weld may be required on the opposite side of the weld to eliminate any EB weld beam blow-through and/or weldment underfill (see Col 8, Lines 29 - 37).

With regard to claim 15:

Dulaney et al. discloses:

Another advantage of the present invention is that the particular repair operation involving the removal of a component portion that encompasses the damage area...(see Col 4, Lines 41 – 43)

A method for repairing a damage airfoil (10) in shown in FIG. 11, airfoil (10) has leading edge damage (12), surface damage (20) and tip damage (80). The weld repair procedure depicted in FIG. 11 is to replace substantially the entire portion of airfoil (10) from above the determined low stress location as indicated by dash line (82) is milled away or cut off leaving a void where the section of airfoil (10) was removed and a stub (84) having cut-away surface (86) for receiving a replacement piece, as depicted in FIG. 12. Replacement piece (88), in the preferred embodiment, is slightly larger in geometry (see Col. 14, Lines 57 – 67) whereby replacement piece (88) is slightly thicker, wider and taller than the removed section. Replacement piece (88) is welded to cut-away surface (84) using electron beam welding technique as depicted in FIG. 13a. A weld joint having seam (90) forms the joinder of replacement piece (88) to stub (84). The weld bead extends along the juncture of cut-away surface (86), stub (84), and

replacement piece (88) past the intersection (92) of stub (84) with replacement piece (88). Airfoil (10) with joined replacement piece (88) forms a joined airfoil which is shaped to be within predetermined dimensional tolerances as previously described and depicted in FIG. 13b. Seam (90) is laser shock processed with at least a single track of overlapping laser processing spots spanning between leading edge (66) and trailing edge (67) (see Col. 15, Lines 1 – 14). The joined airfoil is shaped to return the jointed airfoil to within predetermined dimensional tolerances (step 29) (FIG. 2). In one embodiment, the predetermined dimensional tolerance is substantially the same as a non-damaged airfoil. The process of shaping the joined airfoil comprises contour-milling the joined airfoil to a slightly oversized finished airfoil contour envelope. A subsequent hand-contouring grinding achieves a finished dimension of the joined airfoil (see Col. 12, Lines 29 – 36).

With regard to claim 18:

Dulaney et al. discloses: The joining step may further include the step of welding the replacement piece to the airfoil at the cut away surface (see Col 4, Lines 9 – 10). Furthermore Dulaney et al. disclose: Weldment run-out tabs are spot welded to the replacement piece, and the replacement piece is welded to the airfoil to maintain position prior to electron beam (EB) welding. A "line-of-sight" EB weld bead is deposited on one-side of the airfoil (either the pressure or suction side). A touch-up tig weld may be required on the opposite side of the weld to eliminate any EB weld beam blow-through and/or weldment underfill (see Col 8, Lines 29 - 37).

With regard to claim 20:

Dulaney et al. discloses: The joined airfoil is fixtured in rigid machine tooling and contoured to slightly oversized finish airfoil contour envelope (step 29). A final step of hand contour blending grinds the joined airfoil to a finished dimension (step 29). The resulting joined airfoil has a predetermined dimensional tolerance. In one embodiment of the present invention, the resulting airfoil predetermined dimensional tolerance is substantially that of a non-damaged airfoil (see Col 8, Lines 38 – 45).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 4, 10, 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dulaney et al. (US 6,238,187 B1) in view of Legros (5,152,058).

With regard to claims 4, 10,16:

Dulaney et al. discloses: The claimed invention except for automatically welding mechanism the replacement blade portion to the remaining blade portion.

Legros teaches automatically welding mechanism the replacement blade portion to the remaining blade portion as recited in (Col. 2, Lines 29 – 42).

It would have been obvious to one of ordinary skill in the art at the time of the invention to provide Dulaney with the automatically welding process, as taught by Legros, since such a modification would have automatically carried out repair operations on a succession of identical blades.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hung C. Le whose telephone number is 571-272-8757. The examiner can normally be reached on M-F: 08:00am - 05:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Derris Banks can be reached on 571-272-4419. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

HCL
04/12/2005

DERRIS H. BANKS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 3700